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Do Geese Migrate Domestically?

Evidence from the Chinese Textile and Apparel Industry

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ABSTRACT

The vast majority of empirical literature on "flying geese" examines industrial relocation across national boundaries, in particular in Asia. However, few studies have empirically tested whether this kind of "flying geese" pattern of industrial relocation has occurred domestically in a large country, provided that the regional difference is large enough. Using textile and apparel industry data for the period 1997–2008 in China, the paper shows that until 2004, the textile and apparel industry was still concentrated in the eastern region of China, but starting in 2005, the flying geese phenomenon of industrial relocation began to appear.

Keywords: industrial relocation, flying geese hypothesis, textile and apparel industry, labor-intensive industries

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1. INTRODUCTION

As factor prices rise in a developed country, its labor-intensive industries will gradually lose comparative advantage and many of them will be moved to developing countries with lower factor costs. Japanese economist Kaname Akamatsu (1962) put forward the "flying geese" hypothesis to capture this pattern of industrial relocation from developed to less developed economies. Although there is an expanding body of literature testing the flying geese hypothesis, the vast majority of research examines industrial relocation across national boundaries, with a particular focus on Asia. This is not surprising given that the pattern of flying geese has been clearly observed in the East Asian region over the past six decades: the successive transfer of labor-intensive industries from Europe and America to Japan, and later from Japan to the "Asian Four Little Dragons" (Korea, Singapore, Chinese Taiwan, Hong Kong) and "Asian Four Little Tigers" (Thailand, Malaysia, Indonesia, Philippines), and then to mainland China, India, and Vietnam (Ozawa 1993; Kojima 2000; Kumagai 2008).

In principle, the flying geese hypothesis should also apply to a large country as long as there is a large regional difference in factor prices. However, the empirical literature on flying geese has largely ignored the possibility that this phenomenon could take place within different regions of a large country. One exception is Robert Crandall, who in his seminal book *Manufacturing on the Move* (1993) examined the regional shift of industries in the United States from 1960 to 1993 and found that rising labor costs and union density drove manufacturing industries (automobiles, steel, machine tools) away from the Rust Belt (Midwest and Northeast) to the South and West.

While China and the United States differ in many ways, they share the commonality that both are large nations with differing factor endowments by region. The purpose of this paper is to determine whether or not the flying geese model of industrial transfer has taken place domestically within China, following a pattern similar to that of the United States.

Since reform and opening up in the late 1970s, China has achieved a degree of industrialization that took 200 years to occur in Europe. After more than three decades of continuous growth at an annual rate of about 10 percent, it appears that the era of labor shortage has arrived (Zhang, Yang, and Wang 2010). In the past several years, there have been an increasing number of media reports regarding labor shortages, particularly in the coastal industrial centers. With rising labor costs, some questions naturally arise: Can China maintain its comparative advantage in labor-intensive industries? Will these industries relocate to other countries where cheap labor is abundant, or simply to the interior regions in China?

Cai, Wang, and Qu (2009) argue that because of the existence of large regional differences in productivity and labor costs, China can continue to preserve its comparative advantage in labor-intensive industries for a long time by relocating industries from coastal to interior regions. While studying interprovincial capital flows, Zhang (2009) discovered that starting toward the end of the 1990s, the eastern region's capital began to flow to the central and western regions. On this basis, it appears that the flying geese pattern of industrial relocation can take place across regions within a large country such as China, even though the term has been primarily used to refer to industrial relocation from more developed countries to less developed ones.

However, there is an opposing view on the flying geese pattern of relocation taking place domestically. China's industrialization over the past three decades has been largely cluster-based (Long and Zhang 2009). Thousands of towns specializing in only one product have emerged. The agglomeration has a self-reinforcing effect: owing to the benefit of agglomeration, more firms move to or start up in the clusters. The spatial concentration of industrial activities brings about many positive agglomeration effects, such as easy market access, labor pooling, technology spillovers, and lower entry barriers, which in turn promote productivity and attract more business (Marshall 1920; Sonobe and Otsuka 2006; Ruan and Zhang 2009; Long and Zhang 2009).

Probably due to the large observed agglomeration effect, most of the recent empirical studies suggest that China has not yet reached the stage of flying geese transfer. For example, Wen (2004) calculated the Gini coefficient for various industries in 1980, 1985, and 1995, showing that the majority

of industries' Gini coefficients rose continuously with time, and there has been a significant gathering of industries in the eastern coastal region. Similarly, Fan (2004) showed that between 1980 and 2001, the majority of enterprises were moved to the coastal region. Luo and Cao (2005) also found that from 1997 to 2003, the level of agglomeration of industries in the eastern coastal regions was steadily increasing. Ge (2009) extended the time period to 1985–2005 and arrived at a similar conclusion. Lu and Tao (2009) compared China's level of industrial concentration with that of developed nations during their various stages of industrialization and concluded that industries will continue to concentrate in the eastern regions of China in the foreseeable future.

Moreover, China's internal labor market is increasingly integrated, and the wage gap across regions is smaller than the gap across countries (De Brauw et al. 2002; Zhang and Tan 2007). Because of restrictions on migration, labor markets are largely segmented across countries. Therefore, the major motive behind the commonly seen flying geese pattern is for industries to seek cheap labor in less developed countries. In the context of China, labor market integration may have promoted the regional flow of labor, eased labor shortages in the eastern region, and in turn delayed the departure of the flying geese from the coastal to the interior regions.

Despite the progress in labor market integration, there still exists a large regional difference in wage rates and land prices and other factor endowments within China. Therefore, it is an empirical question to test whether or not flying geese–style transfer has actually taken place in China. However, to our knowledge, no studies have empirically tested the flying geese hypothesis using firm-level data in the context of China.

Following in the spirit of Cai, Wang, and Qu (2009) and Zhang (2009), this paper tests the flying geese hypothesis for the textile and apparel industry during the period 1997–2008. Our data are more recent than the data used in previous —studies that might still have been too early to observe the flying geese pattern of industrial transfer. The textile and apparel industry was chosen because it represents one of the most labor-intensive industries. From a historical perspective, both Europe's industrial revolution and the East Asian industrialization miracle began in earnest with the textile and apparel industry. As these economies developed, this industry gradually shifted to other less developed countries, clearly following the flying geese pattern.

We find that until 2004, the textile and apparel industry was still concentrated in the eastern region of China, but starting in 2005, the flying geese phenomenon of industrial relocation began to appear. The findings have important implications for the understanding of international trade and investment flows. In the near future, the developing countries next on the development ladder may not be the major destinations of industrial investment from China.

The remainder of the paper is organized as follows: The second section describes changes in the textile and apparel industry from 1997 to 2008. The third section provides empirical econometric analysis on the flying geese hypothesis. The paper concludes with section four.

2. CHANGES IN THE TEXTILE AND APPAREL INDUSTRY 1998–2008

The clothing and textile industry studied in this paper refers to the industry classification set by the National Bureau of Statistics for those participating in "textile, garment, footwear and headgear manufacturing." The 1998–2007 data regarding the textile and apparel industry come from the Chinese Industrial Enterprise Database. The 2008 data are from *China's Yearbook of Industrial Economic Statistics 2009* (see appendix for data sources).

A Comparison of Regional Factor Prices

As factor prices are the key drivers behind the flying geese phenomenon, we first present some evidence that there are still large regional differences in land prices and wages in China. Table 1 presents the prices of land for industrial use and wage rates in the eastern, central, and western regions from 1998 to 2008. It is apparent from the information presented in the table that both land prices and wage rates are higher in the eastern region than in the central and western regions. The land price in the east was twice that of the central region in 1998, and by 2008 the ratio had increased to nearly three times. In terms of wage rates, in nominal terms the eastern region was higher in all years than the central and western regions, but the regional wage gap appears to be smaller than the disparity in industrial land prices.

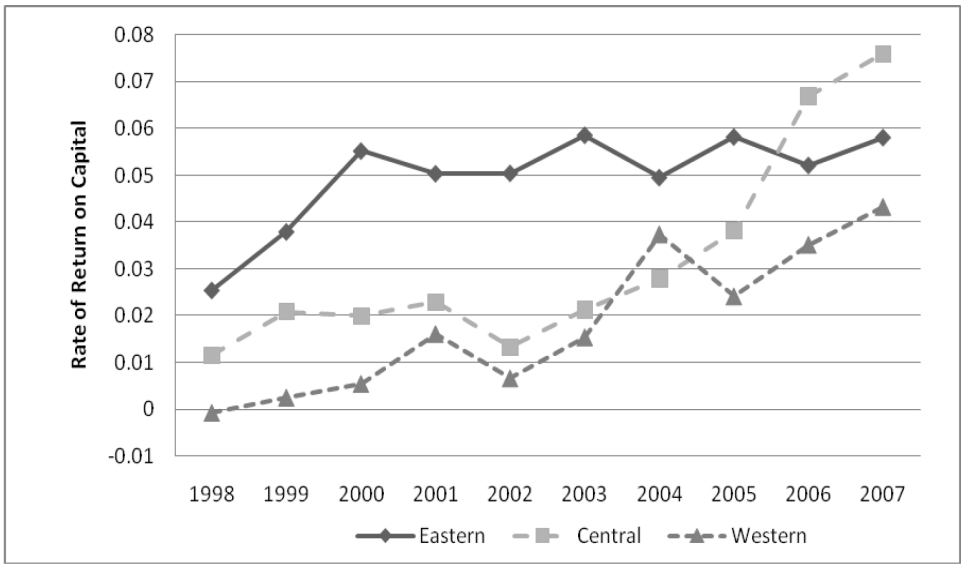
Table 1. Comparison of factor prices in the eastern, central, and western regions

		1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Land Transfer Cost	E	144.41	224.63	246.26	415.40	487.51	299.95	398.44	875.70	957.64	654.81	904.78
	C	67.26	68.94	58.24	91.89	146.75	192.29	204.93	404.79	383.24	269.51	324.28
(10kRMB/ha)	W	89.12	38.68	44.97	66.98	62.87	172.86	218.72	319.51	454.80	300.38	284.01
Avg. Income	E	8.34	9.60	10.90	12.61	14.44	16.15	17.64	19.53	21.58	24.04	26.32
	C	5.87	6.57	7.26	8.27	9.55	10.72	11.91	13.74	15.68	17.95	19.88
(1000 RMB)	W	7.16	8.20	9.28	11.13	12.95	14.11	15.17	16.39	18.62	22.00	23.84

Source: The average cost of land transfer measured is taken from the *China Land and Resource Yearbook* adjusted by national fixed asset price index from *China Statistical Yearbook* with 1998 as a base year. The average wage data come from *Comprehensive Statistical Data and Materials on 60 Years of New China* adjusted by consumer price index from *China Statistical Yearbook* with 1998 as a base year.

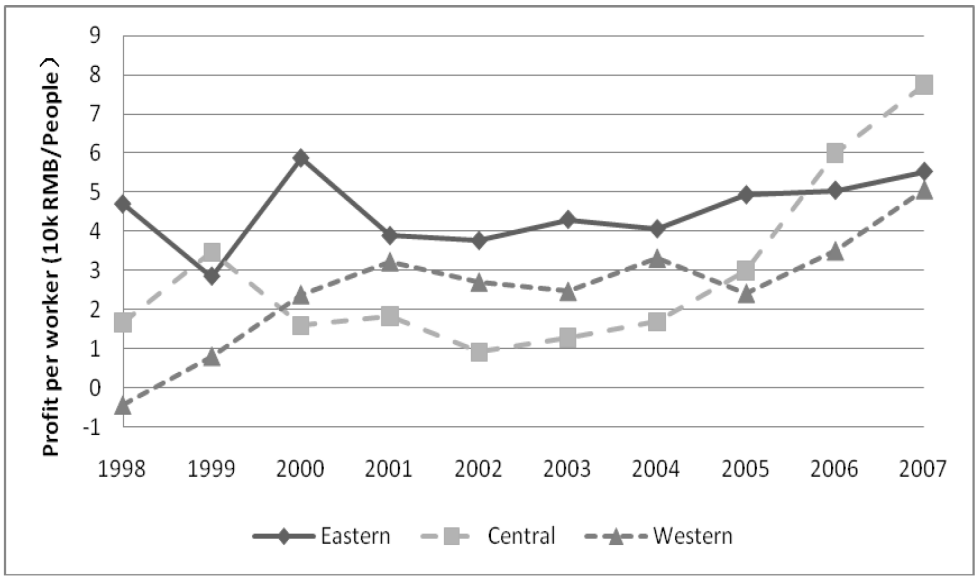
Figure 1 further plots the evolving patterns of return on capital specific to the textile and apparel industry from 1998 to 2007 in the eastern, central, and western regions. As shown in Figure 1, return on capital in the eastern region was continuously higher than in the central and western regions until 2005, but was surpassed by the central region in 2005 and 2006. Figure 2 presents the time trend of profit per worker in the textile and apparel industry in the same period for the three regions. These patterns largely mirror those shown in Figure 1 for the rate of return on capital. Before 2005, profit per worker in the eastern region was higher than in the central and western regions, but starting in 2006 the central region overtook the eastern region, and as of 2007 the western region had nearly caught up with the eastern region.

Figure 1. Rates of return on capital in the textile and apparel industry in three regions



Source: Created by authors.
Note:See appendix for data sources.

Figure 2. Profit per worker in the textile and apparel industry in three regions



Source: Created by authors.
Note: See appendix for data sources.

The labor market has become increasingly tight over the past several years. Table 2 presents statistics from Zhejiang Province's Labor Market Report for the first quarter of 2010. As shown in the table, labor demand far exceeds labor supply in Zhejiang Province. For every job applicant, there are 1.9 openings. The labor shortage is the most severe for young workers in the manufacturing sector. Such a significant labor shortage suggests that the eastern coastal regions may have already reached the point at which they must begin to relocate labor-intensive industries elsewhere.

Table 2. Labor supply and demand for the first quarter of 2010 in Zhejiang Province

	Demand Amount (People)	Opening Rate (People)	Job Opening Rate	Rate of Change Relative to Same Period Last Year
Overall	2894396	1484540	1.95	0.68
16–24 years	710307	384574	2.31	1.01
25–34 years	914974	609173	1.96	0.53
35–44 years	439709	350112	1.72	0.64
Older than 45	143174	140681	1.48	0.56
No Requirement	686232	——	——	——
Unit Leader	33103	23408	1.32	0.36
Prof. & Tech. Personnel	185059	107265	1.59	0.25
Clerical & Related Workers	217507	153846	1.32	0.36
Industrial & Service Personnel	818802	290966	2.47	1
Farming & Fishing Personnel	27274	17193	1.47	0.42
Mfg. of Transportation Equip. Operator	1299296	555271	2.09	0.82
Other	313355	191668	1.51	0.41
No Requirement	——	144923	——	——

Source: Job Seekers; data from *Supply and Demand in Zhejiang's Labor Market in the First Quarter 2010*, Office of Human Resources and Social Security, http://www.zjlss.gov.cn/art/2010/8/4/art_6_17961.html.
Note: Opening Rate = People Needed.

Overall, thanks to its agglomeration advantage, most of the textile and apparel industry is still concentrated in the eastern region. However, due to higher land and labor costs, the eastern region has lost its lead with respect to profit per worker and rate of return on capital, suggesting that it may be economically viable for some textile and apparel enterprises to relocate from the eastern region to the central and western regions.

The Regional Distribution of the Textile and Apparel Industry

Did regional industrial transfer take place between 1998 and 2008 in the textile and apparel industry? Table 3 provides the shares of enterprises, numbers of workers, and output in the textile and apparel industry for the eastern, central, and western regions from 1998 to 2008. It is clear from this data that the textile and apparel industry was primarily concentrated in the eastern region, with its shares of the three indicators around 90 percent. A review of the time trend reveals that the enterprise share consistently increased until about 2004 or 2005 and then reversed its trend. This suggests that prior to 2004, the textile and apparel industry had become clustered toward the eastern region, but the industry has shifted toward the central and western regions since 2004 or 2005.

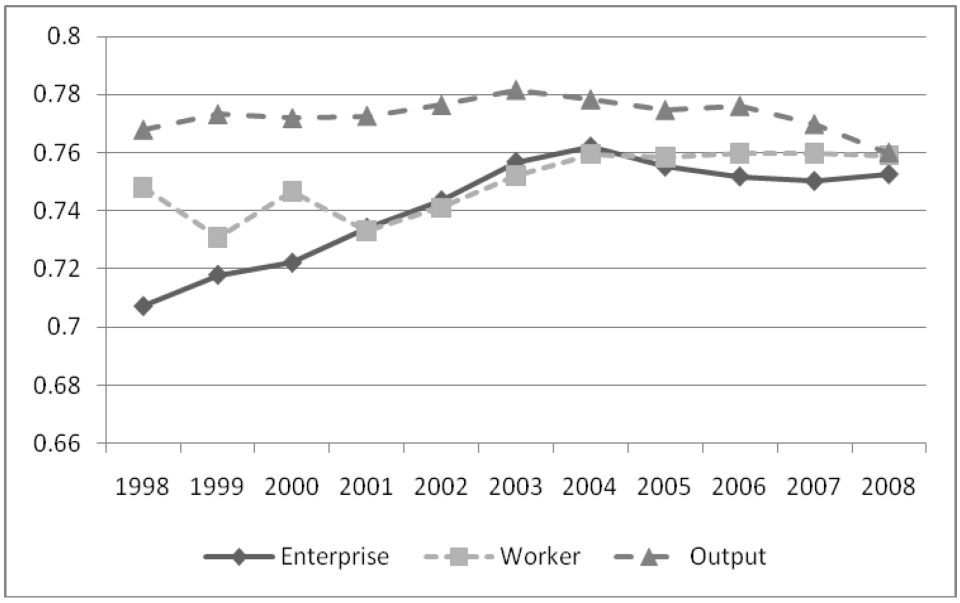
Table 3. Regional comparison of the textile and apparel industry's share of trade

		1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Enterprise Share	E	87.6	88.16	88.43	89.51	90.51	92.02	92.52	92.07	91.76	90.64	89.71
	C	9.75	9.27	8.92	8.32	7.67	6.53	6.59	7.07	7.31	8.34	9.08
(%)	W	2.65	2.57	2.65	2.16	1.82	1.44	0.89	0.86	0.93	1.02	1.21
Worker Share	E	87.09	88.25	88.70	89.27	90.16	91.68	91.90	91.97	91.81	91.25	90.11
	C	10.48	9.61	8.89	8.76	8.11	7.15	7.17	7.18	7.22	7.66	8.63
(%)	W	2.42	2.13	2.32	1.96	1.72	1.16	0.93	0.85	0.97	1.09	1.27
Total Production	E	90.59	91.1	91.89	91.59	92.57	93.74	93.79	93.34	92.84	91.69	90.25
	C	8.4	7.99	7.09	7.19	6.3	5.55	5.51	5.95	6.39	7.28	8.58
(%)	W	1.01	0.91	1.02	1.22	1.13	0.71	0.7	0.71	0.77	1.03	1.17

Source: Calculated by authors.
Note: See appendix for data sources.

To better determine the regional distribution of the textile and apparel industry, we further compute the locational Gini coefficient based on the share of the three indicators used in Table 3 at the provincial level. Figure 3 graphs the time trend of the locational Gini coefficient for the three indicators. The Gini coefficient of the enterprise share rose consistently before 2003 and then declined. The Gini coefficient of the share of output also dropped after 2003, while the trend in employment share largely leveled off over the same period. The findings from Table 3 and Figure 3 suggest a turning point regarding the relocation of textile and apparel enterprises occurring around the mid-2000s.

Figure 3. Locational Gini coefficient in the textile and apparel industry



Source: Created by authors.
Note:. See appendix for data sources.

3. EMPIRICAL EVIDENCE

Most empirical studies on the flying geese hypothesis make use of the revealed comparative advantage (RCA) index (Dowling and Cheang 2000). However, the calculation of the RCA index is mainly based on industrial export data. Obviously, this indicator is not an appropriate tool for examining domestic industrial relocation. In this paper we use an alternative identification strategy to measure the turning point of domestic relocation across regions of a country.

Econometric Model

Similar to the literature on industrial agglomeration, our paper focuses on three major dependant variables: the enterprise share, employment share, and share of output at the provincial level. In order to verify whether or not the flying geese phenomenon of industrial transfer has occurred, we investigate whether the shares of the above three outcome variables have shown a systematic shift across regions over time. Following Zhang (2009), we specify the following empirical estimation:

$$Y_{it} = \alpha Year_t + \beta_p P_i + \beta_T (T * D) + \varepsilon_{it} \tag{1}$$

where Y_{it} is the dependent variable (enterprise share, employment, or output) at time t and province i; t represents different years; $Year_t$ is a set of year dummy variables used to capture any systematic year fixed effects, such as national policy on industrial development; P_i is a set of provincial dummy variables; ε_{it} is a random disturbance item; D is a regional dummy variable with 1 for the eastern region and 0 for the interior region; and T_o is the hypothetical year that industrial relocation occurs. We define T as a dummy variable as follows:

$$T = \begin{cases} 1 & t \geq T_0 \\ 0 & t < T_0 \end{cases} \tag{2}$$

The marginal effect of regional dummy variable D on the explanatory variables is:

$$\partial Y / \partial D = \beta_T * T \tag{3}$$

In conjunction with equation (3) it can be seen that:

$$\partial Y / \partial D = \beta_T \quad t \geq T_0 \tag{4}$$

Equation (4) is mainly meant to determine whether flying geese–model industrial relocation has occurred in a region or not. The key is to test whether there has been a significant change in a region's explanatory variables before and after the turning point T_0. We can vary T_0 in different regressions to empirically test the timing of the turning point.

In equation (1), explanatory variables include yearly dummy variables, provincial dummy variables, and the interaction term between regional dummy variables and the timing of industrial relocation (T). In order to test the robustness of the results, we further replace the provincial dummies with a set of provincial variables and a dummy variable for the coastal region. Thus the new specification can be written as:

$$Y_{it} = \alpha Year_t + \beta_1 D + \beta_T (T * D) + \delta X_{it} + \varepsilon_{it} \tag{5}$$

where X_{it} represents economic, geographical, and institutional factors that may influence the textile industry, and D is a dummy variable for the coastal region. Other variables are the same as in equation (1). To test the flying geese hypothesis, we want to check whether there has been a structural shift in the

coastal variable D with respect to time T_0. In other words, a significant coefficient β_T at time T_0 implies that from that year the flying geese start to head west.

Variable Definitions

The main explanatory variables include the share of enterprises, employment, and output of the textile and apparel industry in a particular province relative to the national total. Similar to previous research, we classify mainland China into two regions, the eastern region and central/western region. We define the dummy variable D as 1 if a province is located in the coastal region and 0 otherwise.

As in Wen (2004), Bai et al. (2004), and Jin, Chen, and Lu (2006), we include six groups of explanatory variables at the provincial level in equation (5): (1) transportation infrastructure: road and rail mileage divided by total administrative area; (2) size of local market: population and per capita gross domestic product (GDP); (3) local protectionism: the ratio of state-owned enterprises (SOE) employment in total employment (4) factor markets: wage rate and land transfer price; (5) export: provincial exports as a ratio of GDP; (6) foreign direct investment (FDI).

The endogeneity problem, which often poses a major challenge in empirical analysis, is not a serious issue in our paper for two reasons. First, the major objective of this paper is to identify the turning point in the direction of industrial investment between the coastal and inland regions. Second, the dependent variables are selected from only the textile and apparel industry, while the explanatory variables are aggregate variables from the province level. The impact of the textile and apparel industry itself on the macro variables is rather minimal. So we can largely treat the macro variables as exogenous in the estimations. The major data set is taken from 1997 to 2008 in 31 provinces (municipalities). The detailed data sources are provided in the appendix.

Empirical Results

Table 4 presents the estimation results for equation (1), with the dependent variable as the share of a province's number of enterprises in the textile and apparel industry. The years in the first row represent the hypothetical point in time that the flying geese relocation takes place. The independent variables include the interaction between the coastal region and the timing of flying geese, provincial fixed effects, and year fixed effects. We can determine whether flying geese relocation occurs or not by looking at the coefficient of the interaction term (βT). The coefficient shows a pattern of gradual decrease. In 1998, it was as high as 2.52, but by 2008 it had dropped to 0.15. It was significant until 2004, when it then became insignificant. The results suggest that the eastern region had enjoyed a significant net increase in the enterprise share of the textile and apparel industry by 2004, although the rate of increase slowed over time. Since 2005, the eastern region's domination of the textile and apparel industry has gradually disappeared.

Table 4. Influence of regional dummy variables on enterprise share

	Explanatory Variable: Enterprise Share										
T_0 over Different Years	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Eastern Region×T(βT)	2.52**	1.48**	1.13**	0.97**	0.85**	0.74**	0.61*	0.47	0.36	0.24	0.15
	(2.20)	(2.21)	(2.21)	(2.30)	(2.33)	(2.23)	(1.88)	(1.45)	(0.99)	(0.53)	(0.22)
Province Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2 after Adjustment	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
AIC	1250.35	1262.07	1266.16	1268.08	1270.17	1272.44	1275.38	1277.87	1279.44	1280.44	1280.81
Observation Number	372	372	372	372	372	372	372	372	372	372	372

Source: Author's estimation.
Note: The symbols ***, **, and * represent significance level at 1%, 5%, and 10%, respectively. The t values are in parentheses.

Table 5 reports the estimations of equation (5), in which the province dummy variables are replaced by a set of economic and social control variables at the provincial level. To identify the flying geese pattern of industrial relocation, we are interested in the last row ($\beta_1+\beta_T$). It was positive until 2004 and turned negative from 2005 to 2008. In other words, the enterprise share in the eastern region first increased and then declined, suggesting a shift in the pattern of industrial relocation between the coastal and inland regions.

Table 5. Effect of regional dummy variable on enterprise share after controlling individual factors

	Explanatory Variable: Enterprise Share									
T_0 over Different	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**
Regional Transportation	-1.36**	-1.42***	-1.48***	-1.56***	-1.60***	-1.62***	-1.67***	-1.54***	-1.45***	-1.41***
	(-2.51)	(-2.65)	(-2.81)	(-2.96)	(-3.03)	(-3.06)	(-3.18)	(-3.00)	(-2.79)	(-2.68)
Population	0.03	0.03	0.04	0.04	0.05	0.05	0.04	0.04	0.03	0.03
	(0.52)	(0.59)	(0.61)	(0.67)	(0.76)	(0.79)	(0.73)	(0.63)	(0.56)	(0.49)
Per Capita GDP	-0.20***	-0.19***	-0.19***	-0.18***	-0.17***	-0.18***	-0.17***	-0.17***	-0.17***	-0.19***
	(-4.81)	(-4.72)	(-4.58)	(-4.48)	(-4.42)	(-4.51)	(-4.43)	(-4.31)	(-4.21)	(-4.48)
FDI	0.00***	0.00***	0.00***	0.00***	0.00***	0.00***	0.00***	0.00***	0.00***	0.00***
	(10.13)	(10.20)	(10.29)	(10.55)	(10.84)	(10.72)	(10.84)	(10.88)	(10.86)	(10.38)
Exports	10.95	11.64	11.7	12.44	13.39	13.2	11.92	10.18	8.85	8.76
	(0.57)	(0.62)	(0.63)	(0.67)	(0.73)	(0.71)	(0.65)	(0.56)	(0.48)	(0.46)
SOE Share	-17.06***	-16.90***	-16.74***	-16.57***	-16.38***	-16.41***	-16.30***	-16.12***	-16.16***	-16.60***
	(-5.64)	(-5.58)	(-5.51)	(-5.51)	(-5.51)	(-5.53)	(-5.46)	(-5.36)	(-5.36)	(-5.47)
Land Price	-10.08	-9.79	-9.4	-9.62	-10.17	-9.12	-7.83	-8.57	-9.43	-9.02
	(-1.19)	(-1.16)	(-1.11)	(-1.21)	(-1.37)	(-1.22)	(-1.06)	(-1.16)	(-1.23)	(-1.15)
Wage Level	3.23***	3.20***	3.16***	3.12***	3.10***	3.07***	3.00***	2.99***	3.03***	3.11***
	(6.59)	(6.49)	(6.36)	(6.36)	(6.49)	(6.53)	(6.42)	(6.29)	(6.21)	(6.39)
Eastern Regionβ1	2.82**	2.82***	2.77***	2.70***	2.52***	2.26***	2.12***	1.96***	1.81***	1.69***
	(2.45)	(3.38)	(4.09)	(4.59)	(4.69)	(4.58)	(4.62)	(4.57)	(4.44)	(4.34)
Eastern Region×T(βT)	-1.41	-1.65*	-1.88**	-2.18***	-2.32***	-2.15***	-2.34***	-2.50***	-2.58***	-2.51**
	(-1.18)	(-1.81)	(-2.38)	(-3.02)	(-3.45)	(-3.27)	(-3.46)	(-3.39)	(-2.96)	(-2.13)
Province Fixed Effect	No	No	No	No	No	No	No	No	No	No
Year Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2 after Adjustment	0.81	0.81	0.81	0.82	0.82	0.82	0.82	0.82	0.82	0.81
Number of	341	341	341	341	341	341	341	341	341	341
β1+βT	1.41	1.17	0.89	0.52	0.2	0.11	-0.22	-0.54	-0.77	-0.82
(P-value)	(0.0005)	(0.0057)	(0.0529)	(0.2873)	(0.6917)	(0.8467)	(0.7051)	(0.4415)	(0.3789)	(0.4999)

Source: Author's estimation.

Note: SOE stands for state-owned enterprises. Perhaps due to a change in the statistical standard, there is a large difference in land prices between 1997 and the following year. As a result, we use data from 1998 to 2008.
The symbols ***, **, and * represent significance level at 1%, 5%, and 10%, respectively. The *t* values are in parentheses.

FDI had a significant positive impact on the share of textile and apparel enterprises, consistent with the findings by Huang and Li (2006), while SOEs had a significantly negative effect. Local wage level was positively correlated with the enterprise share.

Robustness Test

In the above section, the dependent variable is the provincial share of the number of textile and apparel enterprises. To check whether or not the findings of the above section are robust, we repeat the above analyses using the share of employment or output as a dependent variable. Tables 6 and 7 present the robustness check results using these two new dependent variables.

Table 6 repeats the estimations by replacing the dependent variation with the provincial share of employment in the textile and apparel industry. The top half of Table 6 is the estimations based on equation (1). The regression results in the upper panel are very similar to those in Table 4. β_T is positive, suggesting agglomeration in the eastern region. However, its magnitude gradually declines. Until 2004, it was significant in almost all the years except 1999. But since 2005, it has become insignificant, suggesting that the eastern region has lost the labor magnetism needed to attract more employment to this sector. The bottom panel of Table 6 controls for provincial transportation conditions, market size, share of SOEs, factor prices, exports, and FDI in the regressions. The systematic advantage ($\beta_1+\beta_T$) that the eastern region enjoyed in attracting employment in the textile and apparel industry shows a downward trend, starting from 1.89 in 1999, dropping to 0.36 in 2005, turning negative in 2006, and ending at -0.56 in 2008.

Table 6. Effect of regional dummy variable on worker share

	Explanatory Variable: Worker Share										
T_0 over Different Years	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**
Eastern Region×T(βT)	1.33*	0.92	0.75*	0.67*	0.61*	0.56*	0.47*	0.39	0.3	0.21	0.11
	(1.74)	(1.57)	(1.66)	(1.79)	(1.93)	(1.94)	(1.69)	(1.36)	(0.97)	(0.57)	(0.21)
Province Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2 after Adjustment	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
AIC	1164.44	1165.95	1166.95	1167.52	1168.09	1169.14	1171.19	1172.86	1174.17	1175.06	1175.49
Observation Data	372	372	372	372	372	372	372	372	372	372	372
After Controlling for Other Variables											
Eastern Region(β1)		3.17**	3.20***	3.20***	3.13***	2.94***	2.67***	2.55***	2.42***	2.29***	2.17***
		(2.22)	(3.49)	(4.47)	(5.24)	(5.53)	(5.47)	(5.48)	(5.48)	(5.39)	(5.33)
Eastern Region×T(βT)		-1.28	-1.53	-1.83**	-2.11***	-2.20***	-1.98***	-2.19***	-2.46***	-2.66***	-2.73**
		(-0.86)	(-1.53)	(-2.21)	(-2.94)	(-3.37)	(-3.07)	(-3.34)	(-3.41)	(-3.08)	(-2.29)
Province Fixed Effect		No	No	No	No	No	No	No	No	No	No
Year Fixed Effect		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2 after Adjustment		0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
AIC		1600.17	1597.32	1593.17	1588.54	1586.5	1589.73	1588.2	1586.85	1588.49	1593.87
Observation Data		341	341	341	341	341	341	341	341	341	341
β1+βT		1.89	1.67	1.37	1.02	0.74	0.69	0.36	-0.04	-0.37	-0.56
(P-value)		(0.0000)	(0.0001)	(0.0031)	(0.0369)	(0.1480)	(0.2018)	(0.5322)	(0.9517)	(0.6525)	(0.6379)

Source: Author's estimation.

Note: Perhaps due to a change in the statistical standard, there is a large difference in land prices between 1997 and the following year. As a result, we use data from 1998 to 2008 for the regressions in the lower panel.
The symbols ***, **, and * represent significance level at 1%, 5%, and 10%, respectively. The *t* values are in parentheses.

Table 7 uses the output share as a dependent variable with the same specifications as in Tables 5 and 6. From the top half of Table 7, it can be seen that β_T is not significant in any regressions, although β_T reveals a declining trend over time. If using output share as an outcome measure and following the specification of equation (1), we cannot either accept or reject the flying geese hypothesis. The results in the bottom portion of Table 7, which control for regional factors, largely resemble those found previously. As shown in the last row, $\beta_1+\beta_T$ follows a downward trend and turned from positive to negative in 2005, indicating a possible flying geese pattern of industrial relocation from the eastern region to the central and western regions since 2005.

Table 7. Effect of regional dummy variable on output share

	Explanatory Variable: Output Share										
T_0 over Different Years	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**
Eastern Region×T(βT)	0.92	0.58	0.46	0.37	0.34	0.28	0.19	0.1	0.01	-0.1	-0.19
	(1.59)	(1.07)	(1.05)	(1.01)	(1.03)	(0.90)	(0.59)	(0.27)	(0.01)	(-0.20)	(-0.28)
Province Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2 after Adjustment	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
AIC	1234.54	1235.7	1236.22	1236.82	1237.02	1237.55	1238.32	1238.79	1238.92	1238.84	1238.73
Observation Data	372	372	372	372	372	372	372	372	372	372	372
After Controlling for Other Variables											
Eastern Region(β1)		3.05**	3.08***	3.06***	2.95***	2.74***	2.44***	2.28***	2.10***	1.94***	1.81***
		(2.18)	(3.15)	(3.91)	(4.40)	(4.58)	(4.48)	(4.54)	(4.51)	(4.36)	(4.21)
Eastern Region×T(βT)		-1.55	-1.85*	-2.16**	-2.47***	-2.61***	-2.39***	-2.55***	-2.73***	-2.80***	-2.70**
		(-1.05)	(-1.72)	(-2.41)	(-3.11)	(-3.63)	(-3.53)	(-3.85)	(-3.96)	(-3.50)	(-2.32)
Province Fixed Effect		No	No	No	No	No	No	No	No	No	No
Year Fixed Effect		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2 after Adjustment		0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
AIC		1643.78	1640.09	1635.24	1629.83	1626.82	1630.31	1629.63	1629.82	1633.03	1639.19
Observation Data		341	341	341	341	341	341	341	341	341	341
β1+βT		1.5	1.23	0.9	0.48	0.13	0.05	-0.27	-0.63	-0.86	-0.89
(P-value)		(0.0008)	(0.0083)	(0.0692)	(0.3378)	(0.8028)	(0.9277)	(0.6385)	(0.3688)	(0.3068)	(0.4581)

Source: Author's estimation.

Note: Perhaps due to a change in the statistical standard, there is a large difference in land prices between 1997 and the following year. As a result, we use data from 1998 to 2008 for the regressions in the lower panel.
The symbols ***, **, and * represent significance level at 1%, 5%, and 10%, respectively. The *t* values are in parentheses.

The regression results in Tables 6 and 7 largely support the previous findings presented in Tables 4 and 5, showing that from about 2005 the textile and apparel industry began to shift from the eastern coastal region to the central and western regions—in other words, suggesting that the domestic flying geese may have begun to migrate around 2005.

4. CONCLUSION

In the past three decades, China has industrialized rapidly. However, the political and academic debate surrounding whether industries should be concentrated in the future continues unabated. China's rapid industrialization has been largely cluster-based (Long and Zhang 2009). Industrial clustering promotes the division of labor, increases market linkages, and facilities technology spillovers (Marshall 1920). Clustering is particularly important to developing countries because developing countries often have a large labor force but lack capital; thus, clustering plays an effective role in reducing capital barriers (Ruan and Zhang 2009). Owing to the advantages associated with industrial clustering, some analysts, when looking at the future distribution patterns of industrial production in China, conclude that China's future development will continue to rely on industrial clustering in the eastern regions.

But an opposing view argues that to date the eastern coastal region has already attained an acceptable level of clustering. The overconcentration of industries in the eastern region has caused great environmental stress and marginalized the central and western regions. Thus, to minimize these potential problems, general processing and manufacturing industries in the eastern coastal areas should be gradually transferred inland (Wei 2006).

With rising labor costs in the past several years, the labor-intensive manufacturing industry of the eastern region is suddenly facing increasingly significant competitive pressure and is therefore more likely to seek new space to grow. Using data for the textile and apparel industry for the period 1997–2008, we empirically show that starting around 2005 the textile and apparel industry has begun its flying geese–model industrial transfer from the eastern region to the rest of China. The timing of the flying geese migration is largely consistent with that of the Lewis turning point (Zhang, Yang, and Wang 2010).

The phenomenon of industrial transfer taking place within a country is not unique to China. The United States also experienced a similar form of domestic industrial transfer. Early on, American manufacturers concentrated mainly in the eastern region, and later many industries gradually moved from the East Coast to the central and western regions (James 1983). Although this paper focuses on industrial transfer occurring domestically, it is also interesting to consider that similar flying geese–style industrial migration has taken place in the E.U. in both the automotive and textile industries (Hudson 2002). This suggests that flying geese relocation can occur even when both goods and labor markets become integrated.

APPENDIX: DATA SOURCES

The 1998–2007 data on the textile and apparel industry came from the Chinese Industrial Enterprise Database; the source for 1997 and 2008 data relating to the textile and apparel industry was *China's Yearbook of Industrial Economic Statistics*; road density, population, per capita GDP, FDI, exports, share of SOEs, and wage level were calculated using corresponding data from *Comprehensive Statistical Data and Materials on 60 Years of New China*; land price data were taken from the *China Land and Resource Yearbook*.

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